



INDUSTRIAL SHIELDS

USER GUIDE

M-DUINO FAMILY





M-Duino User Guide:

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INDUSTRIAL SHIELDS

COMPACT PLC.



INDUSTRIAL SHIELDS

M-DUINO FAMILY GUIDE



A compact PLC based in Open Source Hardware technology. With different Input/Outputs Units.

Supply Voltage

24 Vcc**Compact**

DIN rail mounting

**Safety**

Industrial communications

I/OsDigital
Analog
Relay

CONECTABLE PLC ARDUINO 24Vcc M-DUINO

MODEL TYPE	21 I/Os	42 I/Os	58 I/Os
Input Voltage	24Vcc		
I max.	0,5A		
Size	100x45x115		
Clock Speed	16MHz		
Flash Memory	32KB of wich 0,5KB used by bootlader		
SRAM	2KB		
EEPROM	1KB		
Comunicaciones	I2C hasta 127 elementos. – Puerto Serie RS-232 (1) – Ethernet Port		
TOTAL Input points	13	26	36
TOTAL Output points	8	16	22
Type of signals			
* Analog Input 10bit (0-10Vcc)	6	12	16
* Digital Input (24Vcc)	13	26	36
* Interrupt Input HS (24Vcc)	2	4	6
* Analog Output (0-10Vcc)	3	6	8
* Digital Output (24Vcc)	8	16	22
* PWM Output 8bit (24Vcc)	3	6	8
Expandability	I2C - 127 elements - Serial Port RS-232 - Ethernet		
Reference	IS.MDUINO.base.21	IS.MDUINO.base.42	IS.MDUINO.base.58
* By using this type of signal can no longer use Digital signal (24Vcc) You must to read product Datasheet. (1) With previous request. IMPORTANT			

Ref. MDUINO-GUIDE.2014.3



Specifications

General Specifications:

Item		M-DUINO 21 IOs	M-DUINO 42 IOs	M-DUINO 58 IOs
Power supply voltage	DC power supply	24Vdc		
Operating voltage range	DC power supply	20.4 to 25.4Vdc		
Power consumption	DC power supply	30VAC max.		
External power supply	Power supply voltage	24Vdc		
	Power supply output capacity	700Ma		
Insulation resistance		20MΩ min.at 500Vdc between the AC terminals and the protective earth terminal.		
Dielectric strength		2.300 VAC at 50/60 HZ for one minute with a leakage current of 10mA max. Between all the external AC terminals and the protective earth terminal.		
Shock resistance		80m/s ² in the X, Y and Z direction 2 times each.		
Ambient temperature (operating)		0° to 45°C		
Ambient humidity (operating)		10% to 90% (no condensation)		
Ambient environment (operating)		With no corrosive gas		
Ambient temperature (storage)		-20° to 60°C		
Power supply holding time		2ms min.		
Weight		250g max.	385g max.	520g max.

Performance Specification:

Item	M-DUINO 21 IOs	M-DUINO 42 IOs	M-DUINO 58 IOs
Control method	Stored program method		
I/O control method	Combination of the cyclic scan and immediate refresh processing methods.		
Programming language	Arduino IDE. Based on wiring (Wiring is an Open Source electronics platform composed of a programming language. "similar to the C". http://arduino.cc/en/Tutorial/HomePage		
Microcontroller	ATmega2560		
Flash Memory	256kb of wich 8 kb used by bootloader		
Program capacity (SRAM)	8kb		



EEPROM	4kb
Clock Speed	16MHz

I/O Pinout:

Base (common unit)			M-DUINO 58 IOs								
			M-DUINO 21 IOs						M-DUINO 42 IOs		
			B Zone			C Zone			D Zone		
A Zone											
M-Duino Connector	Arduino Pin	Function	M-Duino Connector	Arduino Pin	Function	M-Duino Connector	Arduino Pin	Function	M-Duino Connector	Arduino Pin	Function
SCL	21	SCL	I0.12	A5	Analog/ Digital In	I1.12	A11	Analog/ Digital In	I2.12	NC	NC
SDA	20	SDA							I2.11	NC	NC
RX1	19	RX1	I0.11	A4	Analog/ Digital In	I1.11	A10	Analog/ Digital In	I2.10	A15	Analog/ Digital In
TX1	18	TX1									
RX2	17	RX2	I0.10	A3	Analog/ Digital In	I1.10	A9	Analog/ Digital In	I2.9	A14	Analog/ Digital In
TX2	16	TX2									
RX3	15	RX0	I0.9	A2	Analog/ Digital In	I1.9	A8	Analog/ Digital In	I2.8	A13	Analog/ Digital In
TX3	14	TX0									
PIN9	9	bus	I0.8	A1	Analog/ Digital In	I1.8	A7	Analog/ Digital In	I2.7	A12	Analog/ Digital In
PIN7	7	bus									
PIN3	3	bus	I0.7	A0	Analog/ Digital In	I1.7	A6	Analog/ Digital In	COM-I2.6	NC	GND I2.6
PIN2	2	bus							I2.6	21	Interrupt 2 In
TX0	1	TX0	COM-I0.6	NC	GND I0.6	COM-I1.6	NC	GND I1.6	COM-I2.5	NC	GND I2.5
RX0	0	RX0	I0.6	3	Interrupt 1 In	I1.6	19	Interrupt 4 In	I2.5	20	Interrupt 3 In
			COM-I0.5	NC	GND I0.5	COM-I1.5	NC	GND I1.5	COM-I2.4	NC	NC
24Vdc	-	-	I0.5	2	Interrupt 0 In	I1.5	18	Interrupt 5 In	I2.4	NC	NC
Gnd	-	Gnd	COM-I0.4	NC	GND I0.4	COM-I1.4	NC	GND 1.4	COM-I2.3	NC	GND I2.3
			I0.4	26	Digital Input	I1.4	31	Digital Input	I2.3	35	Digital Input
			COM-I0.3	NC	GND I0.3	COM-I1.3	NC	GND I1.3	COM-I2.2	NC	GND I2.2
			I0.3	25	Digital Input	I1.3	30	Digital Input	I2.2	34	Digital Input
			COM-I0.2	NC	GND I0.2	COM-I1.2	NC	GND I1.2	COM-I2.1	NC	GND I2.1
			I0.2	24	Digital Input	I1.2	29	Digital Input	I2.1	33	Digital Input
			COM-I0.1	NC	GND I0.1	COM-I1.1	NC	GND I1.1	COM-I2.0	NC	GND I2.0
			I0.1	23	Digital Input	I1.1	28	Digital Input	I2.0	32	Digital Input
			COM-I0.0	NC	GND I0.0	COM-I1.0	NC	GND I1.0			
			I0.0	22	Digital Input	I1.0	27	Digital Input			
AREF	AREF		NC	NC	NC	NC	NC	NC	NC	NC	NC
IOREF	IOREF		NC	NC	NC	NC	NC	NC	NC	NC	NC
IOREF1	IOREF1		Q0.7	6	Analog/PWM /digital Out	Q1.7	11	Analog/PWM/ digital Out	Q2.7	NC	NC
7Vdc (out)	+7Vdc		Q0.6	5	Analog/PWM /digital Out	Q1.6	10	Analog/PWM/ digital Out	Q2.6	13	Analog/PWM/ digital Out
Gnd	Gnd										
3.3Vdc (out)	+3.3Vdc		Q0.5	4	Analog/PWM /digital Out	Q1.5	8	Analog/PWM/ digital Out	Q2.5	12	Analog/PWM/ digital Out
Gnd	Gnd										
5Vdc (out)	5Vdc		Q0.4	40	Digital Out	Q1.4	45	Digital Out	Q2.4	NC	NC
gnd	gnd		Q0.3	39	Digital Out	Q1.3	44	Digital Out	Q2.3	49	Digital Out
			Q0.2	38	Digital Out	Q1.2	43	Digital Out	Q2.2	48	Digital Out
			Q0.1	37	Digital Out	Q1.1	42	Digital Out	Q2.1	47	Digital Out
			Q0.0	36	Digital Out	Q1.0	41	Digital Out	Q2.0	46	Digital Out
			NC	NC	NC	NC	NC	NC	NC	NC	NC
			NC	NC	NC	NC	NC	NC	NC	NC	NC
			Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd
			Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd

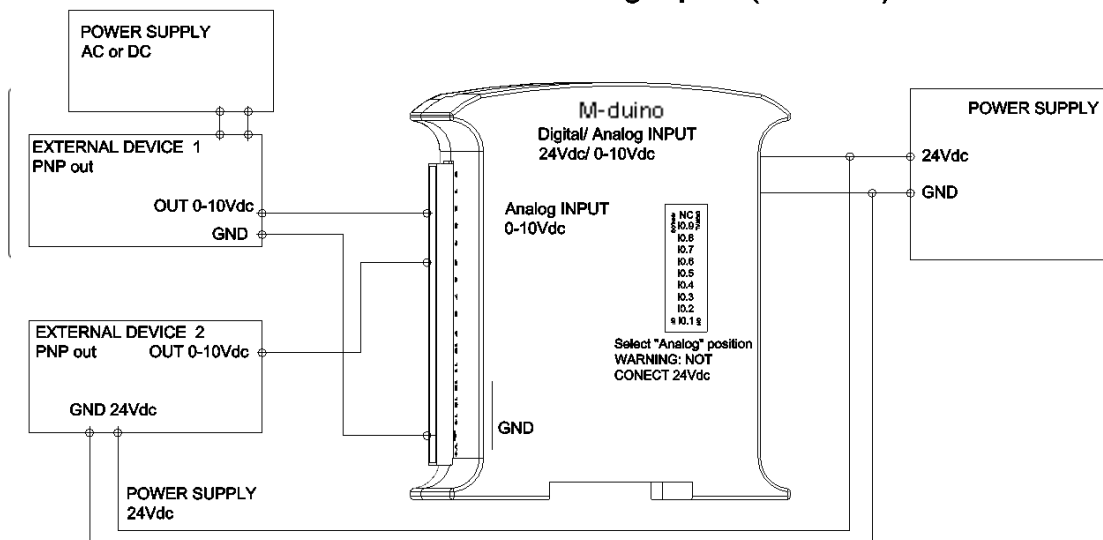


HOW TO CONNECT:

Analog/ Digital In:

Pins I0.7, I0.8, I0.9, I0.10, I0.11, I0.12, I1.7, I1.8, I1.9, I1.10, I1.11, I1.12, I2.7, I2.8, I2.9 and I2.10, can work in two different modes. Analog and Digital input signal.

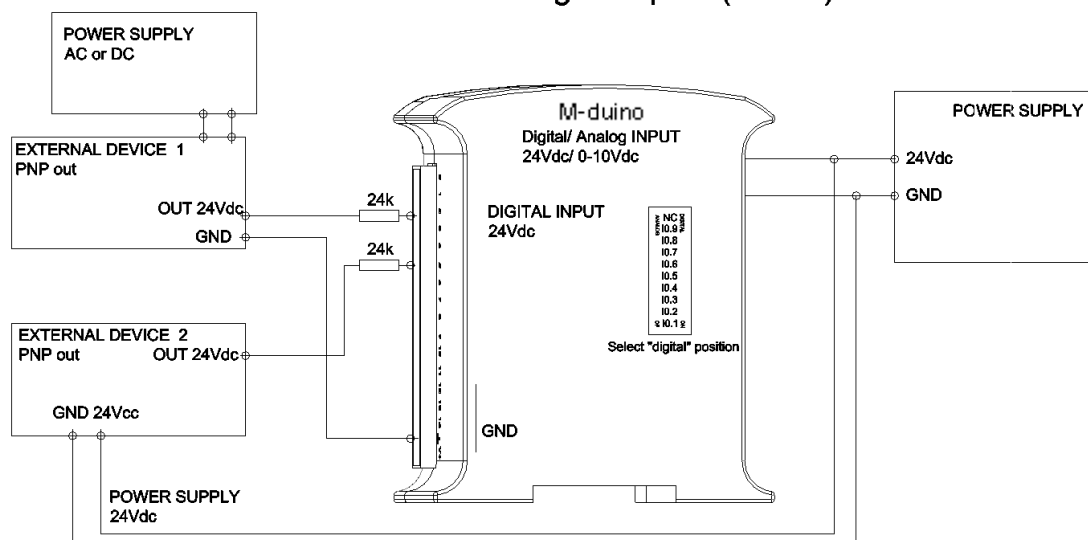
Connection analog Inputs (0-10Vdc)



Select the correct "SWITCH" in "Analog" position. WARNING:DO NOT CONNECT 24Vdc – (10Vdc max.)

DIGITAL	I0.12	ANALOG	DIGITAL	I1.12	ANALOG	DIGITAL	I2.12	ANALOG
	I0.11			I1.11			I2.11	
	I0.10			I1.10			I2.10	
ON	I0.9	OFF	ON	I1.9	OFF	ON	I2.9	OFF
	I0.8			I1.8			I2.8	
	I0.7			I1.7			I2.7	
	NC			NC			NC	
	NC			NC			NC	
	NC			NC			NC	
	NC			NC			NC	
	NC			NC			NC	
ON	NC	OFF	ON	NC	OFF	ON	NC	OFF

Connection digital Inputs (24Vdc)





Select the correct "SWITCH" in "Digital" position.

DIGITAL	I0.12	ANALOG
	I0.11	
	I0.10	
ON	I0.9	OFF
	I0.8	
	I0.7	
	NC	
	NC	
	NC	
	NC	
	NC	
ON	NC	OFF

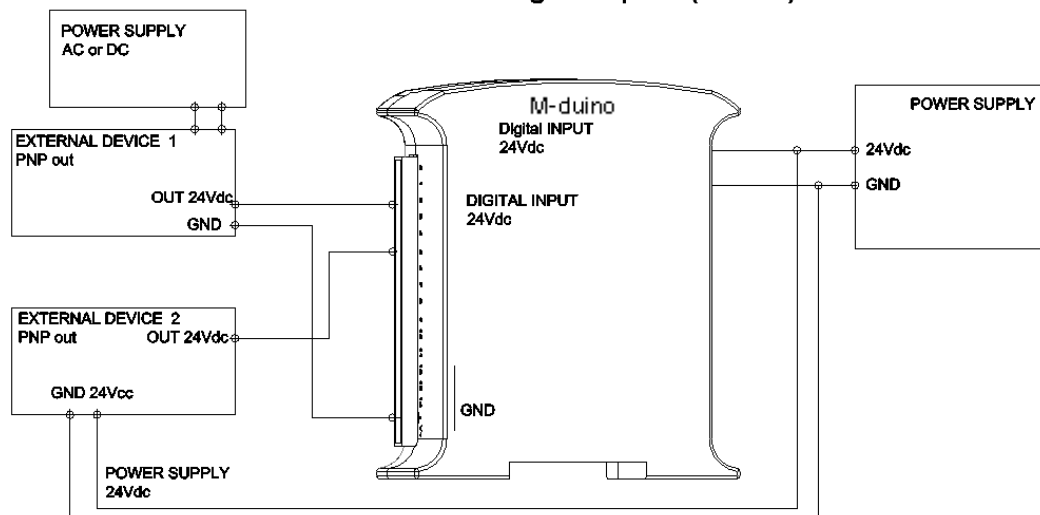
DIGITAL	I1.12	ANALOG
	I1.11	
	I1.10	
ON	I1.9	OFF
	I1.8	
	I1.7	
	NC	
	NC	
	NC	
	NC	
	NC	
ON	NC	OFF

DIGITAL	I2.12	ANALOG
	I2.11	
	I2.10	
ON	I2.9	OFF
	I2.8	
	I2.7	
	NC	
	NC	
	NC	
	NC	
	NC	
ON	NC	OFF

Digital Input:

Pins: I0.0, I0.1, I0.2, I0.3, I0.4, I1.0, I1.1, I1.2, I1.3, I1.4, I2.0, I2.1, I2.2, I2.3.

Connection digital Inputs (24Vdc)





Analog/PWM/digital Out:

You can configure the signal of:

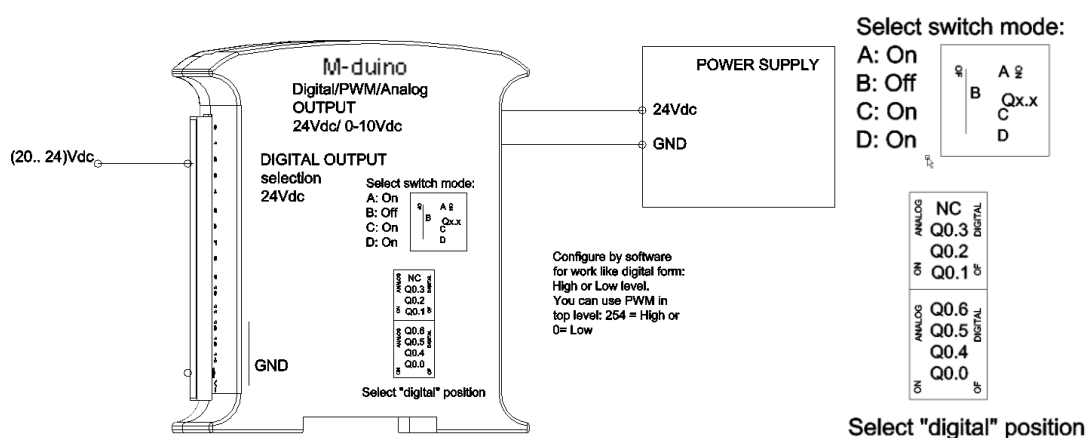
Q0.5, Q0.6, Q0.7, Q1.5, Q1.6, Q1.7, Q2.5, Q2.6 and Q2.7.

A	B	C	D	Vout
On	On	On	On	10Vdc
On	Off	On	On	24Vdc

Digital Output:

With 10Vdc configure, you can use Digital signal or Analog Signal:

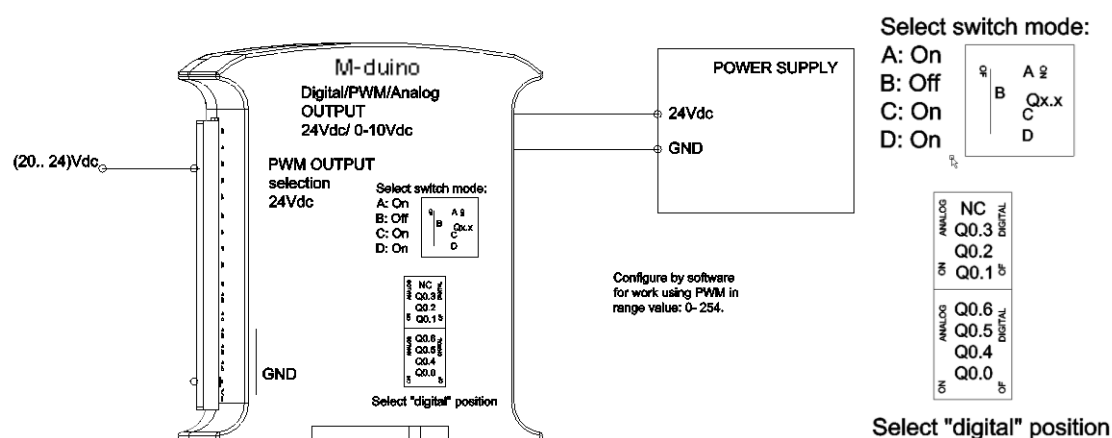
Connection digital Output (24Vdc)



Configure by software for work as digital form: High or Low level.
You can use PWM: 254=High and 0=Low

PWM Output:

Connection PWM Output (24Vdc)



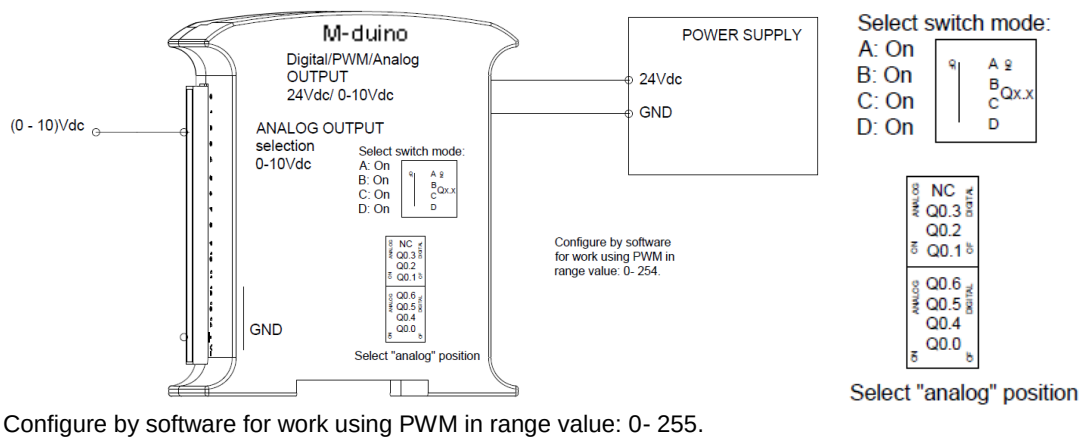
Configure by software for work using PWM in range value: 0- 254.



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Analog Out:

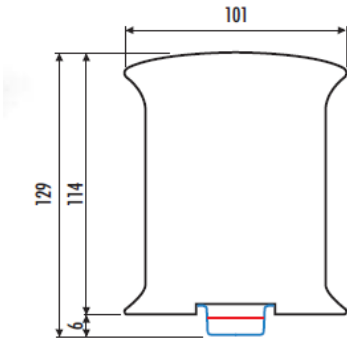
Connection analog Output (0-10Vdc)



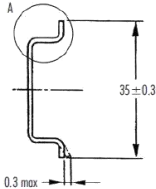
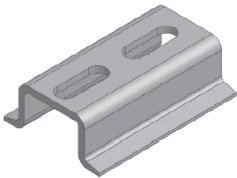
Configure by software for work using PWM in range value: 0- 255.

Mechanical Characteristics

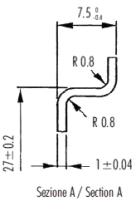
- Dimension M-duino Family:



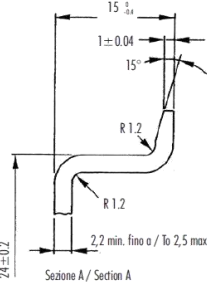
- DIN rail mounting:



Profilato a cappello TH 35-7,5
Top hat rail TH 35-7,5



Profilato a cappello TH 35-15
Top hat rail TH 35-15



CARATTERISTICHE	METODO	UNITA' DI MISURA	BLEND PC/ABS
Meccanico			
Resistenza a trazione allo snervamento	ASTM D638	MPa	68
Resistenza a trazione a rottura	ASTM D638	MPa	48
Allungamento a rottura	ASTM D638	%	59
Modulo in flessione	ASTM D790	MPa	2894
Prova Load con intaglio	ISO 180/14	KJ/m ²	5.5
Termiche			
Temp. di ammolimento Vicat, metodo B	ASTM D1525	°C	114
Temperatura Ricotti 1.81 MPa	ASTM D446	°C	97
Fisiche			
Peso specifico	ASTM D792	g/cm ³	1.21
Ritiro nello stampo	ASTM D955	%	0.4/0.6
Melt Flow Index 260°C - 99N	ASTM D1238	g/10'	11.1
Comportamento alla fiamma			
Autosostentenza (min di spessore)	UL94	-	V-0 (0.8)
Filo Incandescente 3.2 mm	IEC 6095 2.1	°C	960

Italtronic si riserva il diritto di modificare il materiale con cui realizza i propri prodotti senza obbligo di preavviso.

FEATURES	TEST METHOD	UNITS	BLEND PC/ABS
Mechanical test			
Resistance to tensile stress at yield	ASTM D638	MPa	68
Tensile strength	ASTM D638	MPa	48
Ultimate elongation	ASTM D638	%	59
Flexing modulus	ASTM D790	MPa	2894
Load test notched	ISO 180/14	KJ/m ²	5.5
Thermal test			
Vicat softening temperature method B	ASTM D1525	°C	114
Reheating temperature 1.81 MPa	ASTM D446	°C	97
Physical test			
Specific gravity	ASTM D792	g/cm ³	1.21
Mold shrinkage	ASTM D955	%	0.4/0.6
Melt Flow Index 260°C - 99N	ASTM D1238	g/10'	11.1
Flame test			
Self extinguisher (thickness in mm)	UL94	-	V-0 (0.8)
Incandescent thread 3.2 mm	IEC 6095 2.1	°C	960

Italtronic can operate any change of the materials without being obliged to forewarn.

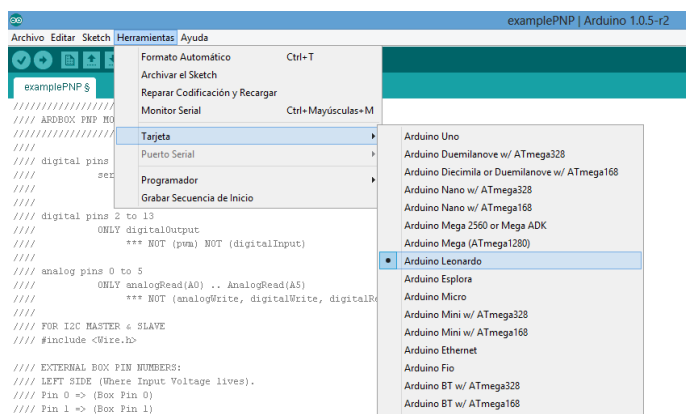


Software Interface:

Arduino IDE is compatible for programm these PLCs. You must to download a start code in www.industrialshields.com at product page in “document files”section and then It’s necessary open it with Arduino IDE.

Configuration about Arduino IDE:

All Ardbox PLCs use an Arduino Leonardo and you need to choose these opcion in Arduino IDE.



About Industrial Shields:

SPAIN

Avda. Castell de Barberà 26, nave 9

08210 Barberà del Vallès (Barcelona)

Tel.+34 635693611

Mail: industrialshields@industrialshields.com



FAQ:

I can not find a specification for the inputs. What are the switching levels (VIH, VIL) and how much current is required to drive the inputs? What are the minimum and maximum voltage levels that can be applied without damage?

How do the outputs work? Are these Open-Collector (or Open-Drain) outputs or Push-Pull type? Is it possible to connect inductive loads (is the output equipped with a recovery diode)? The maximum allowed current for each output channel is given as 80mA - is it valid for both directions, i.e. connecting loads to 24V and GND?

Do the digital signals that work at TTL level (e.g. I2C) have protection elements in order to use the Ardbox in a harsh industrial environment? NOT YET

What does 24Vdc stand for? I only know 24VDC as an abbreviation for 24 volts "direct current" - is it the same? Yes. It is 24 VDC

What class of isolation do the relays outputs provide?

What type of fuses are installed in the device?

As this is a complete device (not just a board level component like the Arduino itself) do you have (or plan to have) some certificate of CE compliance?